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THE AMERICAN
JOURNAL OF PHARMACY

JANUARY, 1917

A LETTER FROM THE ORIENT.[1]

MASTIC AND ITS ORIENTAL USES.

By John Uri Lloyd, Phar.M.

A series of studies such as I am making is increasingly interesting and instructive. After having obtained second-hand information all one's life concerning Oriental drugs and products, it is refreshing to study them in their homes, and to become acquainted with the methods of collecting, sorting, and preparing. Indeed, I cannot but feel that I have done myself an educational injustice not to have more than once made the effort to learn what a person concerned in drugs should know at first hand, by personal investigation. I am quite of the opinion that, for more reasons than one, it would have been the proper thing had I made such excursions as this long ago, and contributed the results to others. But enough. My object is not to intrude professional study in a letter, however interesting it may be to me.

The methods of life of the Orientals are very instructive. The foods are often somewhat peculiar, as also are the creatures eaten. Nor do we have to go to the land of the Turks for examples. For instance, whoever visits Naples makes a mistake if he misses the *Aquarium*. It is the most complete in the world. Indeed, the world of science contributes to its support. Our Smithsonian Institution makes to it an annual donation of money. Here are to be seen the sea creatures of the Mediterranean Sea, alive, and content. In great glass compartments are the many swimming and creeping things that

[1] Written in Naples, March 26, 1906. The article on Mastic was written in Smyrna, some months later. The right is reserved to its use by a medical and pharmaceutical journal. *J. U. L.*

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live beneath the surface of the ocean. Separated are they from each other, because most of them agree about as do the lion and the lamb. Here we see a tank in which we behold a number of creatures that somewhat resemble a great brown shoe, with two glaring eyes in the heel. From beneath come eight arms that everlastingly stretch and again contract, much like India rubber pipes. They project themselves now here, now there; they grasp whatever they touch; they seize a bit of food and next, the arm contracts. Into the stomach beneath the eyes of the creature the helpless victim is irresistibly drawn. But while this is occurring the other arms are stretching in and out, are slipping up and down, are searching near and far, for anything possible. The creature moves as though it, too, were a prey of those rubber arms, which stick by rows of suckers to whatever they touch, and which, in full-grown specimens, have the power of grasping a man and drawing him down to the ocean's depths as easily as these do an unfortunate fish. This is the *octopus,* and the Mediterranean Sea is prolific in them.

Next we turn to a tank in which at first glance we see only rough stones and sand. But, on closer examination we perceive that some of the rough stones are *alive.* They are fish that have the power of imitating the objects among which they rest, both as to color and form. This one is reddish, that one is brown, or black, or yellow, in accordance with the objects among which it lies. Hideous creatures are they, lying there silently awaiting a fish that fails to perceive that stones such as they have mouths. Let us add this fact to the familiar motto, "Stones have ears."

Now the sand *moves,* a darting creature rises from it, and then slowly settles down—to become again *sand.* It is a great flat fish that, now we have located it, is seen to lie so close to the sand and to so nearly resemble it, as to make it impossible to tell where sand ends and fish begins. There are others invisible—we see their still eyes looking upward, but no one can trace their bodies.

The next tank contains crabs with legs, "feet" in length. There are tanks of coral, of miniature sharks, of transparent squids, and hosts of fish and other creatures of all colors, shapes, sizes and habits. The water is as clear as air, the creatures live before our eyes, the most instructive object-lesson of the world concerning aquatic life of this most interesting, semi-tropical sea.

Go now to the market place in Naples. There we find the same hideous creatures—sold as food. Here are baskets of the *octopus.*

the same rubber-like arms, the same glaring eyes. This basket may contain a number of small ones, that basket a few arms chopped off a very large body. Here are the repulsive fish that resemble stones, there the transparent squids, next the cuttle fish, not less unsightly. In fact, whatever the sea breeds seems here to become food for man, or, in its native home, to use man as a food. It is a question, I take it, simply as to which is the stronger—sometimes the man eats the octopus, again the octopus eats the man.

Whoever travels as I am now traveling needs leave his squeamish stomach at home. Ask no questions. Eat whatever others eat. That is good philosophy, and it is good breeding, too. Withal, it is but a difference in education—the man who, in America, eats the slimy oyster or the slippery clam need not criticize him who in this land considers the octopus a delicacy. Nor yet should the man who, amid home surroundings, eats lobster, be sensitive or impatient if here his host serve him a not less repulsive, but more ungainly horned creature instead.

I will close by saying that I have left my family in Smyrna, a city under the dominion of the Sultan of Turkey. I am on my way down the Red Sea to the port of Aden, just around the lower point of Arabia. There I expect to have exceptional opportunities in the way of exact information concerning some subjects that I wish to investigate. Thence I shall return to Turkey and spend as much time as possible among the Oriental products of that country. It is a land of historical charm, and of intense richness in many directions that concern medicine. Both the people and the officials of the various governments spare no effort to give me the opportunity to do well my work. I am taking a great number of photographs in the way of drug studies, as well as life conditions. These I hope to classify on my return, and by such illustrations make effective and instructive lessons on special subjects.

Mastiche (Mastic).

History.—The island of Scio, or Chio, lies in the Mediterranean Sea about six hours by steamer from Smyrna. It has long been celebrated in that a pocket of the northern part furnishes the world's supply of mastic. This, too, notwithstanding the fertility of adjacent islands, and their situation as concerns exposure and climate.[2]

[2] The circumscribed area of sections producing certain drugs, fruits and natural products, is noticeable enough to warrant a special paper on the subject of such limitations in the Orient.

That the tree will thrive elsewhere is exemplified by the fact that a photograph taken by me of a mastic tree in the garden of Mr. Alfred A. Keun, near Smyrna, is dripping (May 6th) with the transparent, brilliant tears. In the island of Chio, one district is called *Mastikohoria,* which means "Village producing gum mastic," and this district supplies the world with its mastic.

Mastic, like other Oriental gums, resins, and balsams, has been known from antiquity, Theophrastus (4th century before Christ), Dioscorides and Pliny recording it as a product of Chio. It was formerly of great importance, as is indicated by the following record.[3]

In the Middle Ages the mastic of Scios was a monopoly of the Greek Emperors. The successor of Andronicus II (1304) gave the mastic concession to a rich Genoese named Benedetto Zaccarias, whose family proceeded to rebel against the Emperor, becoming sovereigns of Scio. Subdued by Andronicus III, the island was retaken (1346) by the Genoese, a company called the Giustianiani being formed to do "mastic" and other business. It was very rich, and compared with the famous East India Company, having its own mint, constitution and government, even engaging in wars with the Turks. Severe was their law concerning *mastic,* cruel their punishment of intruders or offenders. In 1566 the Turks captured the island, which since that date has been under Moslem rule. The tribute they levied on the inhabitants was that the ladies of the Sultan's harem should be supplied, free of all expense, with all needed supplies of the choicest of mastic. This little island of Chios, on account of its mastic, has been a center of Oriental interest from the earliest days. It is still famed for its resin, but has lost its former prestige, owing to the waning importance of mastic.

Description.—The mastic tree or shrub grows to the size of a small, scraggly, crab tree, being more bush-like. Much does it resemble the crataegus tree of America. Its bark and small limbs carry numerous ducts that are prone to part with their resinous secretion. This, as it exudes, is brilliant, colorless, water-white, about the consistence of glycerin or honey, and exudes from abrasions, or even forces itself through the natural bark, dripping therefrom in tears. I observed limbs without any visible abrasions and yet, glistening with tears. The slightest abrasion is followed by an abundant flow of gum, and this fact leads to the method of collection.

About June, the ground below the trees is cleansed of trash, and

[3] See Pharmacographia by Flückiger and Hanbury.

roughly prepared to catch the drip. Then the branches are lavishly scarified with superficial incisions. The resinous juice immediately begins to exude and drips to the earth, where, of different qualities as concerns cleanliness, it gradually hardens. It is thus a conglomerate of isolated tears, agglutinated fragments, and masses of uneven consistence, the quality being in accordance with the foreign matter present, such as fragments of bark, leaves, sand and dirt. Since a single large shrub is capable of producing ten to twelve pounds, and the resinous tears drop in profusion beneath the shrubs, the glitter of the crystal masses on the limbs, in the sunshine, is very pleasing.

When the fallen tears are dry, or hard enough to be handled, the mastic is picked up by means of tongs or pinchers, put into baskets, and sold to local dealers. It is then called kilista.[4] The merchant employs girls and women to separate the grades, in which the large, single, transparent tears are "first." This quality is largely used by the rich Turkish ladies, who chew it as a breath perfume. The irregular, semi-opaque masses constitute the second quality, whilst the mixture of small fragments of all consistencies makes a third, very low grade.

Opalescence or dulness of mastic globules or tears may be due to dust on the surface, adhering impurities, scratched or abraded surface. In order to brighten it, the hard, dry fragments are placed in tanks of cold water, and hand washed, sometimes with a preliminary scrubbing with soap-suds. The friction between the fragments removes the dust, and brightens the surface to a glass-like transparency. This manipulation is most successful in cool, dry weather, October and throughout the winter being the season selected.

Steamers touching at Chios are boarded by men with baskets of peculiarly shaped little earthen vases filled with fine chewing mastic, which they sell for 2½ piastres each. These have been celebrated from "time immemorial," and are today in form and size as they were in times gone by.

Mastic is gathered from June to September, the process being disturbed if there be excessive rains. No adulterations of mastic are consummated in Turkey, but, since the drug is offered elsewhere cheaper than it is supplied in Smyrna, where the product of Chios naturally gravitates, it may be inferred that manipulative processes are elsewhere possible.

[4] This word is spelled for me by Mr. Alpiar of Smyrna.

Commercial Features.—As is shown in our historical introduction, mastic was once one of the important Oriental products. As already stated, it has from times gone by been prized by the ladies in the rich Turkish harems as a breath perfumer, and is yet so employed by the Turkish people. That this use is not illogical from a sanitary stand is shown by the fact that mastic carries a decided volatile aromatic that is powerfully antiseptic, which cannot be said of all "chewing gums." Possibly the nearest American chewing-gum approach to mastic in this sense, is the natural "spruce gum" of the north, or the "sweet gum" of the middle west and the south, both of which carry breath-sweetening, antiseptic aromatics. Mastic is to be found in the Turkish bazaars generally, being displayed in the shop in separate piles of different qualities. Choice tears are often sold in boxes holding about an ounce, labeled properly. The price was formerly as high as Forty-five Dollars per kilogramme, but is now about Two Dollars, the second and third qualities ranging from One Dollar to One Dollar and Twenty Cents per kilogramme. About 200,000 kilogrammes are produced each year, of which 170,000 kilogrammes are exported. Its field as a varnish-maker is much restricted, owing to the abundance of less costly resins, whilst as a constituent of pharmaceutical preparations, such as ointments, in which, during Mediaeval times, mastic was important, is now practically obsolete.

Raki, or *Rakee* or *"Mastic."* This is a popular, mastic-flavored, alcoholic cordial liquor, much drunk by the non-Moslem populations of some parts of Turkey, but not by Mohammedan people, who, so far as I could determine, use no alcoholics. This drink is made by distilling a mixture of mastic and anise with strong wine or alcohol, the following being the formula of Mr. Agop Alpiar:

Take of

Alcohol 35 per cent.	1,000	c.c.
Aniseed oil	2.5	gm.
Mastic	15	gm.
Potassium carbonate	3	gm.

Mix together and distill, slowly reserving the fractions as follows:

No. 1	250 c.c.
No. 2	350 c.c.
No. 3	160 c.c.

To No. 2 (350 c.c.) add 10 grams powdered sugar. This is *Raki* or *Rakee,* the drink known also as *Mastic.*

After this process, the drink subsequently is continuously made as follows:

Mix No. 1 (250 c.c.) with No. 3 (160 c.c.) and add water, 90 c.c.; alcohol (35 per cent.) 500 c.c.; aniseed oil 1.25 gm.; gum mastic 7.5 gm.; and potassium carbonate 3 gm.

Distill as before, the second portion (350 c.c.) constituting Raki. Thus the process may be continued indefinitely, the second fraction of distillate being reserved for use.

The inferior grades of mastic are utilized in making this drink, of which 300,000 litres are estimated as the yearly output.

Raki or *Mastic* is a colorless, transparent liquid, of a pleasant, aromatic, anise-mastic flavor. The drinker does not take it clear, but adds to it about one third its bulk of water, which by precipitation of the volatile oils, turns the mixture milky. Owing to its strong alcoholic composition, this drink is used in moderation, but to Americans it does not appeal. It reminded me of *paregoric,* rather than of a grateful cordial.

Confection of Mastic.—A much-prized confection of mastic is prepared by making a syrup of sugar, and when it is reduced by boiling to a very thick consistence, stirring into it a sufficient amount of powdered mastic[5] to flavor it. This produces a stiff confection of a pearly white color, that I was informed is especially a favorite with the Greeks. It is served as a course by itself, with a cool drink, or as a separate course of sweet after a meal. The following formula was given me by Mr. Lymberis of Smyrna.

CONFECTION OF MASTIC.

Sugar	3 lbs.
Water	2 pts.
Citric acid	1 dram
White of one egg.	
Mastic, powdered	¾ oz.

Dissolve the sugar and acid in the water, and stir in the white of egg. Boil, skimming occasionally, until the thick syrup will retain

[5] Powdered mastic is made by mixing enough sugar with hard, small tear mastic to prevent its agglutination when rubbed in a mortar. Like camphor, to which a few drops of alcohol are added, it cannot be powdered alone. *J U. L.*

its form when dropped on a piece of cold marble, or when a small amount is poured into cold water. Remove from the fire, cool in a capacious vessel, and then stir in the powdered mastic. In this connection it may be stated that an item of great interest to me was the numberless forms of sweets and cakes the Oriental people consume.

NOTE ON THE DETERMINATION OF BORIC ACID BY TITRATION IN THE PRESENCE OF GLYCEROL.

By B. H. St. John.

The method usually given for the titration of boric acid is as follows:

Add methyl orange and neutralize with normal sulfuric acid, adding a few drops in excess, then boil to expel carbon dioxide, cool and exactly neutralize with *N*/10 sodium hydroxide solution. Enough glycerin is then added so that the solution shall contain at least 30 per cent. and the solution titrated to a pink color with phenolphthalein.

In the course of some determinations the author noted that in the neutralization to methyl orange with *N*/10 sodium hydroxide solution after boiling off the CO_2, a very slow and unsatisfactory color change occurs. With the hope of obtaining a sharp color change methyl red was tried in place of the methyl orange. The change of color, as is usual with methyl red, was quite sharp and entirely satisfactory.

The necessity then arose of checking the accuracy of the results obtained by using methyl red in this titration.

Accordingly a sample of boric acid was prepared by recrystallizing a commercial product from hot water. The crystals after being sucked as dry as possible on the filter were dried over conc. sulfuric acid.

Four solutions were prepared by dissolving 0.2000 Gm. of this pure boric acid in about 30 Cc. of water. To two of these methyl orange was added, and to the other two methyl red. These solutions appeared acid to methyl red but alkaline to methyl orange. However one drop (about 0.03 Cc., *N*/10 alkali sufficed to cause the methyl red to indicate a neutral state. And 0.10 Cc. *N*/10 acid

changed the methyl orange from the distinctly alkaline yellow color to the neutral tint. The sharpness of this color change with methyl orange seems to indicate that it is not the boric acid which causes the slow color change noted.

After the neutralization of the solutions, glycerin was added and then titrated to a pink color with phenolphthalein. The boric acid calculated from these titrations averaged, in the solutions neutralized to methyl orange 0.2007 Gm., in those neutralized to methyl red 0.2001.

When glycerin is added to a solution containing methyl red the indicator changes its color to red and as the titration proceeds the red color fades slowly, the point at which the indicator is half transformed occurring when about half the alkali necessary for titration with phenolphthalein has been added.

Titration of Boric Acid in Solutions Containing Sodium Carbonate.

Several solutions were prepared containing in each 1 Gm. sodium carbonate with a known amount of boric acid, thus simulating the conditions met with in the determination of boric acid. The titrations were carried out according to the method given below. The endpoints obtained with methyl red in the neutralization of excess acid were as sharp as usual but those obtained with methyl orange were, as the author had noted before, indistinct. Can it be that the endpoint of methyl orange is affected by a considerable amount of salts in the solution titrated? The results of these titrations are given in the attached table.

Method.

The solution was carefully neutralized in the cold with normal sulfuric acid and about 0.2 to 0.3 Cc. added in excess, the beaker being covered with a watch glass meanwhile to avoid loss by effervescence. The solution in the beaker, still covered with the watch glass, was quickly heated to boiling and boiled about 1 minute. In the case of the solutions in which methyl red was used as indicator, if the color had faded and become alkaline, normal acid was added until the red color was restored and the boiling continued for 1 minute. The solutions were then cooled to 20 to 25° and neutralized with tenth normal sodium hydroxide solution. The neutral point with methyl orange being taken as that point where a clear yellow

appears and all suggestion of pink or orange shade has disappeared. An equal volume of neutral glycerin was then added and the titration completed to the appearance of a pink color with phenolphthalein.

It is essential that care should be taken to cool the solution to room temperature before neutralizing as the indicators change color at a decidedly different hydrogen ion concentration when warm.

It will be seen that the results obtained by the use of methyl orange are high, while those obtained in the titrations in which methyl red was used, with one exception, are very close to the theoretical.

Boric acid taken.	Sodium carbonate taken.	H_3BO_3 found methyl orange.	Error.	H_3BO_3 found methyl red.	Error.
0.2000 Gm.	1.0 Gm.	0.2003 Gm.	+0.15%	0.1988 Gm.	−.60%
0.2000 "	" "	0.2038 "	+1.9%	0.2004 "	+.20%
0.2000 "	" "	0.2024 "	+1.2%	0.2001 "	+.05%
0.2000 "	" "	0.2034 "	+1.7%		
0.2500 "	" "	0.2523 "	+ .92%	0.2497 "	−.12%
0.2500 "	" "			0.2501 "	+.04%
Average error.....			1.17%		0.10%

Conclusions.

The results seem to indicate that methyl red can be used in place of methyl orange in the titration of boric acid, that it is more satisfactory since a sharp endpoint can be obtained, and that more accurate results can be obtained.

SOME COLOR REACTIONS OBTAINED FROM THE EXTRACT OF ACER SPICATUM (FALSE VIBURNUM OPULUS, VIBURNUM OPULUS U. S. P. VIII).

By B. H. St. John.

Contribution from the Laboratory of the American Medical Association, Chicago, Ill.

Some two years since, while in the service of the Bureau of Chemistry, the author was engaged in the examination of a number of patent remedies which were claimed to be of value in the treat-

ment of female troubles. Several of these were found to give Börntrager's test for emodin. However, other tests failed to classify the emodin-like material as any of the common emodin-bearing drugs, *i. e.*, aloes, cascara, rhubarb or senna.

Knowing the common use of the Viburnums in preparations designated for the treatment of female diseases, the idea suggested itself that an uncommon emodin-like substance might occur in the commercial drug or fluidextract, or perhaps was a common adulterant. Accordingly Börntrager's test was applied to samples of commercial fluidextracts of *Viburnum opulus* and *Viburnum prunifolium* which were available.

The test was carried out in the following manner:

The fluidextract in a separatory funnel was diluted with about three volumes of water, about 5 Cc. concentrated hydrochloric acid added, and the mixture shaken with about one fourth of its bulk of petroleum ether. After settling the petroleum ether was decanted into a test tube containing 2 to 3 Cc. of 10 per cent. ammonia water, and allowed to stand, whereupon the crimson color appears at the juncture of the two liquids and gradually diffuses down into the ammonia.

The fluidextract of *Viburnum prunifolium* gave only a faint yellow color, while the fluidextract of *Viburnum opulus* gave a very characteristic test.

Considering the possible adulteration of this fluidextract of *Viburnum opulus,* a sample of cramp bark—labeled Viburnum Opulus U. S. P. VIII—was obtained and a fluidextract prepared from it according to the U. S. P. VIII. (A portion of this sample was submitted to the Bureau's pharmacognosist for examination, but a report identifying this as *Acer spicatum* was not received until the author, then working in the laboratory of the American Medical Association, had satisfied himself that such must have been the case.) The fluidextract prepared from this sample was tested immediately after its preparation by Börntrager's test as given above, and was found to give the test only very faintly.

About eight months later Dr. W. S. Hubbard's work on the separation of the common emodin-bearing drugs again brought to the author's mind this question of an emodin-like substance in *Viburnum opulus*—or rather *Acer spicatum.* Hubbard found that ether was more satisfactory than petroleum ether in Börntrager's test since the emodin or emodin-like material is more soluble in the

former. He also found that the ether extract from rhubarb, obtained in a process similar to that used for Börntrager's test, when shaken with a saturated solution of ferrous sulphate, imparts a deep blue color to the aqueous solution; also, that when the same ether extract was shaken with calcium hypochlorite solution a red color developed in the aqueous solution.

The fluidextract of *Acer spicatum* (supposed *Viburnum opulus*) which had been prepared eight months before, was examined by these tests in the following manner:

The diluted, acidified fluidextract was shaken with one eighth of its volume of ether (not petroleum ether) and the ether layer decanted off and used for the tests. When underlaid with 10 per cent. ammonia water a brilliant red ring appeared at once. When shaken with a saturated solution of ferrous sulphate the same deep blue color found by Hubbard with rhubarb extracts appeared in the aqueous layer. However, when shaken with calcium hypochlorite solution, only a faint yellow color appeared in the aqueous layer.

The fluidextract itself appeared to have become darker in color.

These tests were also tried on several extracts of *Viburnum prunifolium* with negative results, only a slight yellow color being imparted to the aqueous solution in any of the tests.

Some months later the author entered the Laboratory of the American Medical Association. There were available samples of fluidextracts of *Acer spicatum* and *Viburnum opulus* prepared by Mr. L. E. Warren from drugs which had been carefully identified by a pharmacognosist. The fluidextract of *Acer spicatum* was about four months old when tested, that of *Viburnum opulus* thirteen months.

These were subjected to the above tests. The fluidextract of *Acer spicatum* gave the tests described very positively, just as the fluidextract which the author had prepared had done. That of *Viburnum opulus* gave results exactly similar to those previously obtained with fluidextracts of *Viburnum prunifolium*.

The author was thus led to believe that the sample from which the fluidextract on which he had worked previously had been prepared was in fact *Acer spicatum*. The report of the Bureau's pharmacognosist later bore out this fact.

A fresh fluidextract of *Acer spicatum* was prepared from the standardized material available. Immediately after preparation it was found to give the tests with ammonia water and ferrous sulphate

solution described above, but, as had been noted before, the color obtained in the test with ammonia water is not as intense as that obtained with older extracts. This apparent increase, on aging, in the amount of the material which gives the test with ammonia, as indicated by the intensity of this test, opens the question: is it not present originally as a different compound which is changed either by simple oxidation or by means of ferments existing with it in the bark, into the substance which gives the reaction?

Farwell (*Bull. of Pharmacy,* 1913, XXXIII, p. 65) points out that most of the drug sold as *Viburnum opulus* is in fact *Acer spicatum.* Kraemer in the second edition of his pharmacognosy also states that the drug described in the U. S. P. VIII is in fact *Acer spicatum.*

This accounts for the fact that several commercial fluidextracts of *Viburnum opulus,* as well as a few proprietary remedies claiming to contain *Viburnum opulus,* gave the tests described above.

Summary.

Acer spicatum contains a substance which gives a crimson color with ammonia, and which may be similar to the emodins of the common cathartic drugs. It also contains a substance which gives a blue color with ferrous sulphate solution similar to that obtained with rhubarb.

Further it seems that these two reactions should be of value for the identification of extract of *Acer spicatum* in medicinal preparations. Hubbard has shown that rhubarb, alone of all the common "emodin-bearing" cathartics, gives the blue color with ferrous sulphate solution. Rhubarb is distinguished from *Acer spicatum* by the red color which the former gives with the calcium hypochlorite test. The identification of *Acer spicatum* in the presence of rhubarb, of course, cannot be accomplished by these tests.

Contribution from the Laboratory of the American Medical Association.

THE REASONS FOR SOME OF THE CHANGES IN THE FORMULAS OF GALENICALS MADE IN THE NINTH REVISION OF THE UNITED STATES PHARMACOPŒIA.[1]

By George M. Beringer, Ph.M.

Compliance with the legal standards, if there was no other reason, would necessitate a study of the changes made in the Ninth Revision of the Pharmacopœia. As my assignment in the symposium of this evening has been restricted primarily to Extracts, Fluidextracts and Tinctures, I will, necessarily, limit my remarks very largely to the changes made in the formulas for certain of these galenical preparations. To the pharmacists, these are of the first importance and the users of the book should certainly understand why the changes have been made.

While the reasons for some of the changes may be apparent, the writer is aware, from the criticisms and queries propounded, that the reasons for many of these are not generally understood. Hence, it appears that this phase of the subject is worthy of special consideration and that an explanatory paper on pharmacopœial changes, even though it may sound elementary to some of my hearers, may not be an undesirable subject to present to this audience and, at the least, it may be of some assistance to students.

The changes in the titles of fluidextracts, extracts and tinctures have not been very numerous or important. The changing of the title Fluidextractum Rhamni Purshianæ to Fluidextractum Cascaræ Sagradæ was in recognition of the almost universal practice of physicians in using the latter title. The custom of physicians in prescription writing not infrequently determines changes in pharmacopœial titles.

The adoption of Cardamom Seed instead of Cardamom Fruit necessitated a reduction in the amount of Cardamom directed in several of the formulas, such as Compound Extract of Colocynth, and in Tincture of Cardamom and Compound Tincture of Cardamom, as the inert capsule is eliminated.

Economic reasons, at times, have decided changes. An instance of this is seen in the official oleoresins, which, with the exception

[1] Read at the meeting of the Philadelphia Branch of the A. Ph. A., November 14, 1916.

of Oleoresin of Cubeb, are again directed to be made with ether as a solvent instead of acetone. In the Eighth Revision, acetone was directed in place of ether, because at that time the former was cheaper. As it is now permissible to use denatured alcohol in the manufacture of ether, that solvent is made so cheaply that it is again advantageous to use it in place of acetone.

One of the most noteworthy advances in the present revision has been the adoption of introductory chapters and the classifications and type processes given under Fluidextracts and Tinctures, thus saving a number of pages in the book and avoiding the unnecessary repetition of instructions. It is hoped that this attempt at condensing formulas will prove satisfactory and may be still further extended in future revisions.

The popularity and extensive use of powdered extracts required pharmacopœial recognition of a number of the extracts in this form. Among these may be mentioned Powdered Extracts of Aconite, Belladonna Leaves, Colchicum Corm, Gelsemium, Hydrastis, Rhubarb, Stramonium and Viburnum Prunifolium. In addition, Purified Oxgall is now official in the form of a powdered extract, and this class of powdered extracts will probably be added to in the future revisions.

The subcommittee recommended that a distinct class of Pulvextracta should be made so as to distinguish these from the pilular extracts. The conservatism of the General Committee of Revision, however, decided that the pilular or solid extracts and the powdered extracts should not be separated but all retained under the one class of Extracta and that in the monographs where both forms were recognized, the formula for the pilular extract should precede that for the powdered extract.

The preparation of powdered extracts presented some worrisome problems for the consideration of the subcommittee. In order to obtain a concentrated extract freed as far as possible from mucilaginous and gummy extractives, so as to permit of powdering and dilution in the form of a permanent powder, higher alcoholic menstruums had to be adopted than were required, as a rule, for the pilular extracts. Where the drug contained any appreciable amount of oil or fat, it was found that this had to be removed before a satisfactory powdered extract could be produced. Hence, in the Powdered Extracts of Aconite Root, Colchicum Corm, Nux Vomica and Physostigma, purified petroleum benzin extractions had to be made

to remove the fat, and in some cases, the recovery of the alkaloid from the benzin solutions became necessary. These added manipulations complicated somewhat the processes.

The standardizing of potent galenical preparations, wherever possible, is now an established principle in our pharmacopœia, and the ninth revision has carried this out more fully than heretofore. In the Extracta, this presented to the committee the problem of selecting proper diluents by which concentrated extracts could be reduced to the standard adopted. Our experiments led to the adoption of powdered starch dried at 100° C. or, in some cases, a mixture of powdered and dried starch and magnesium oxide as the diluent for powdered extracts. In the introductory chapter on Extracts, however, permission has been given to the manufacturers to use other inert diluents, such as sugar, sugar of milk, powdered glycyrrhiza, magnesium carbonate, or the finely powdered drug or marc from which the extract was made. A satisfactory diluent must be inert from a therapeutic standpoint, as well as chemically. It is difficult to select one substance that will prove preëminently satisfactory for all of the extracts. The committee had some difficulty in coming to a conclusion as to the proper diluent to recommend for reducing the stanardized solid extracts. The final selection was glucose, as possessing the requisite qualification of being inert. Yet this has not proven altogether satisfactory and it may be possible that some other substance may yet be proposed as a substitute for glucose, and suggestions in this respect are invited.

The selection of a proper menstruum for each extract likewise required considerable experimentation. The U. S. P. VIII directed that Extract of Belladonna Leaves be made with a menstruum of two volumes of alcohol and one volume of water. With many samples of the drug, the manufacturers found that if the drug was completely exhausted with this menstruum that the yield was large and the extract was deficient in alkaloidal content. Hence, in the U. S. P. IX, a stronger alcoholic menstruum has been directed, namely, three volumes of alcohol and one volume of water, so as to reduce the amount of extractive and permit of maintaining the alkaloidal standard.

Extract of Ergot, U. S. P. VIII, was a roundabout process copied after the British Pharmacopœia and yielded a small amount of extract associated with sodium chloride and at a very high cost. The committee were convinced that hydrochloric acid in proper

proportion should be added to the alcoholic menstruum used in the extraction of ergot. Several of the samples of ergot worked with by the committee contained relatively large proportions of oil and unless this was removed, the resulting extract was granular and oily. Hence, in order to obtain a smooth and homogeneous product, the oil had to be removed from the ergot by purified petroleum benzin before it was percolated with the alcoholic menstruum.

In Pure Extract of Glycyrrhiza, two changes are to be noted: The first is the use of chloroform water, following the initial menstruum a mixture of ammonia water and water, to complete the exhaustion of the drug. The purpose of the chloroform water is that decomposition in both the drug and in the percolate before concentration, which is prone to take place in warm weather, may be prevented. The second change is the omission of the five per cent. of glycerin which was directed in the eighth revision. Experience has shown that pure extract of glycyrrhiza made with this small amount of glycerin is apt to become moldy. This is possibly due to the percentage of glycerin being insufficient to act as a preservative, and in this dilution it actually serves to provide a suitable field for the culture of molds.

A small percentage of tartaric acid was found to aid materially in the exhaustion of hydrastis. Hence, in the Powdered Extract of Hydrastis, 5 grammes of that acid is directed for each 1,000 grammes of drug extracted.

In the U. S. P. VIII formula for Extract of Nux Vomica, the nux vomica was first exhausted with a menstruum of acetic acid and water, and the concentrated acetic extract then treated with alcohol. In the formula of the U. S. P. IX, the extraction of nux vomica is made with a mixture of three volumes of alcohol and one volume of water, which menstruum extracts the drug and yields an extract which, when purified by the removal of the fat, appears to be entirely satisfactory.

Extract of Malt, instead of being directed to be evaporated "to the consistence of thick honey," which is not at all definite, is now directed to have a specific gravity of not less than 1.35 nor more than 1.40.

The fluidextracts recognized in the U. S. P. are, in number, greatly in excess of those recognized by any of the other pharmacopœias. In the endeavor to improve on the U. S. P. VIII formulas, the subcommittee made several hundred experiments trying

various menstruæ and methods of manipulations. For the first time in the revisions of the U. S. Pharmacopœia, fractional or divided percolation is directed. This process, Type Process C, is now not only permissible, but is officially directed to be employed in the fluidextracts of aconite, aromatic powder and bitter orange peel.

The type samples prepared by several of the committees which had worked with this class of preparations in the previous revisions had been preserved and reports on these were secured. The original samples, wherever available, were carefully inspected, and the changes both in amount and character of precipitate noted. The experiments led to the adoption of a number of changes in the menstruums directed and, for several, entirely new formulas are introduced.

In the following Fluidextracts, an increase in the alcoholic strength of the menstruum directed is to be noted: Bitter Orange Peel, Belladonna Root, Buchu, Guarana, Hyoscyamus, Pilocarpus, Podophyllum, Sarsaparilla, Staphisagra, Sumbul and Uva Ursi.

Numerous complaints showed that it was practically the universal opinion that in the Fluidextract of Buchu of the Eighth Revision, the menstruum of three volumes of alcohol and one volume of water was incorrect, and alcohol is now directed.

A reduction in the alcoholic strength of the menstruum is to be noted in the following Fluidextracts: Gelsemium, Ipecac, Senna and Triticum.

The U. S. P. VIII directed that Fluidextract of Cascara Sagrada should be made with a menstruum of four volumes of alcohol and six volumes of water. Our knowledge of cascara sagrada and its constituents now permits us to direct the extraction of the drug with hot water and the addition of the alcohol to the concentrated aqueous percolate as a preservative only. This improvement has been made in both the fluidextract of cascara sagrada and in the powdered extract, in both of which the extraction of the drug is directed to be made with water.

The Aromatic Fluidextract of Cascara Sagrada of the U. S. P. VIII was criticized in several respects. First, the attempt to extract the glycyrrhiza along with the cascara sagrada by the use of magnesium oxide. The proper solvent for licorice is, beyond any question, ammonia water and the extraction of these two drugs should not be made together, as either magnesium oxide or calcium oxide is the required alkali for the extraction of cascara sagrada.

The flavoring with compound spirit of orange was likewise criticized. In the formula directed in the U. S. P. IX, these objections have been met by directing the use of pure extract of glycyrrhiza and a change in the aromatics to a combination of the oils of anise, cassia, coriander, and methyl salicylate. Any slight tinge of bitterness remaining is drowned by the further addition of 1 gramme of saccharin to the 1,000 mils of product.

In Fluidextract of Cinchona, the addition of 100 mils of diluted hydrochloric acid to the menstruum was found necessary in order to exhaust the drug. Without this addition of acid, the resulting fluidextract failed to represent even approximately the total amount of alkaloid in official cinchona bark.

In Fluidextract of Colchicum Seed, while no change is made in the menstruum of two volumes of alcohol and one volume of water, some means had to be adopted to remove the oil which is extracted, possibly largely mechanically, and separates in the fluidextract. Hence, in the formula for this fluidextract, the preliminary treatment of the drug with purified petroleum benzin is now directed.

The Digitalis preparations present an interesting study. It developed that in the preparations of digitalis containing a large percentage of water, deterioration rapidly takes place. Further, that the deterioration in the presence of acids was very much more rapid and that an acetic preparation of digitalis very soon lost its efficiency. This can be explained on the ground that digitalis contains glucosidal principles and likewise an acid constituent, and in aqueous or dilute alcoholic preparations a reaction takes place between these constituents by which the glucosides are decomposed. In the fat-free tincture of digitalis, the acid is neutralized and thus the increased permanency of this preparation is explained.

A material increase in the percentage of alcohol in the official preparations of digitalis was indicated and the fluidextract instead of being directed to be made with a menstruum of diluted alcohol, is now directed to be made with a menstruum of five volumes of alcohol and one volume of water. For the same reason, the alcoholic strength of the tincture has been increased by the use of a menstruum composed of three volumes of alcohol and one volume of water in place of diluted alcohol.

In Fluidextract of Ergot, the U. S. P. IX has returned to the recommendation of Dr. E. R. Squibb and directs in the menstruum the use of 20 mils of hydrochloric acid in place of 20 Cc. of acetic acid of the U. S. P. VIII.

In the Fluidextract of Frangula, the similarity of this drug to Cascara Sagrada has suggested that the same method of preparation should be adopted for both fluidextracts and this was found to be entirely feasible. So Fluidextract of Buckthorn Bark is now directed to be made by hot aqueous percolation and the alcohol added to the concentrated infusion as a preservative only.

In the Fluidextract of Glycyrrhiza, we note an entire change in the formula. The U. S. P. VIII directed the extraction of glycyrrhiza with boiling water, thus obtaining a large amount of inert matter which it was difficult to remove by the subsequent manipulation directed. The new formula directs the extraction of the drug with a menstruum of ammonia water and chloroform water, and completing the exhaustion with chloroform water. The first portion of the percolate is set aside as a reserve. The alcohol is directed to be added only as a preservative. The waste of this solvent in the previous formula is thus avoided.

In Fluidextract of Ipecac, the attempt has been made to produce a miscible fluidextract from which a syrup could be made by simple admixture instead of the roundabout process for the preparation of the syrup directed in the U. S. P. VIII. Instead of extracting the drug with a menstruum of three volumes of alcohol and one volume of water and obtaining in the product resinous and other inert materials which had to be precipitated out in the preparation of the syrup, the attempt was to produce by the use of a menstruum of diluted hydrochloric acid, alcohol and water, a miscible fluidextract. This appears to have been overlooked, however, in the syrup of ipecac, as the formula of the U. S. P. VIII has still been retained, and the syrup will unnecessarily contain acetic acid in addition to the hydrochloric acid.

In the Fluidextract of Lobelia, the menstruum formerly directed was a mixture of acetic acid and water. This is now displaced by a menstruum of acetic acid and diluted alcohol, which promises a stable and active preparation.

In the Fluidextract of Nux Vomica, the acetic acid directed in the U. S. P. VIII has been deleted from the menstruum, as a menstruum of alcohol and water in the proportion of three volumes of alcohol and one volume of water directed has been found to be satisfactory. Acetic acid dissolves from nux vomica substances which later continue to precipitate and cause trouble in the preparations and there appears to be no necessity for any acid in this fluidextract.

In Fluidextract of Squill, we have one of the most important changes made in this class of preparations. Squill presents a troublesome problem. Its large content of mucilage and sugar make it difficult to percolate with the ordinary solvents. The U. S. P. VIII directed that Fluidextract of Squill should be made by percolating 1,000 Gm. of the drug with a menstruum of acetic acid and water until 1,000 Cc. of percolate was obtained. No attempt whatever was made to exhaust the drug or to obtain a fluidextract of full strength, even if it were possible to carry out the instructions and percolate the drug with this dilute acetic acid menstruum.

The process now directed was proposed by Dr. J. M. Francis. The squill is first exhausted with a menstruum of two volumes of alcohol and one volume of water, and with a hydro-alcoholic menstruum of this strength, squill can be percolated. The percolate is then concentrated and alcohol is added to precipitate out the mucilage and sugars. The alcoholic liquid decanted from the syrupy residue is again concentrated and made up to the requisite volume by the addition of diluted alcohol. This is necessarily a tedious and an expensive process, but yields a fluidextract of squill which appears to be permanent and fully represents the activity of the drug.

In Fluidextract of Senega, a change in manipulation is to be noted. The alcoholic strength of the menstruum remains the same as in the previous edition, but no alkali is added to the menstruum. Solution of potassium hydroxide is eliminated from the formula and in place thereof ammonia water is added to the finished product until a faint alkaline reaction is produced. The reason for this change in manipulation is that precipitation and gelatinization in fluidextract of senega is prevented by maintaining an alkaline liquid. The alkali that gives the best results is ammonia water, and in order to insure alkalinity being maintained, this is added in slight excess to the finished product.

The Eighth Revision directed that Fluidextract of Senna should be made with a menstruum of diluted alcohol and that the drug should be previously percolated with alcohol to remove the griping principle. This preliminary treatment with alcohol and drying of the drug is very expensive. The U. S. P. IX endeavors to obtain the same results by preparing the fluidextract by using a weaker alcoholic menstruum composed of one volume of alcohol and two volumes of water and omitting the preliminary extraction of the drug with alcohol.

In the Tinctures, several changes are of special interest. In Tincture of Arnica, in order to insure the exhaustion of the drug, *interrupted percolation* is directed.

In Tincture of Cantharides, a process of maceration with warm alcohol is directed. The cantharides directed (10 per cent.) can never be fully extracted by the alcohol and all we can succeed in doing is to make a saturated alcoholic solution of the active constituent, and this is attained by macerating at a temperature of 50 to 55° C.

In Compound Tincture of Gentian, the addition of glycerin and the reduction of the alcoholic strength to that of diluted alcohol is to be noted.

In Tincture of Iodine, in order to insure the solution of the iodine, 50 mils of water per liter is added.

Tincture of Kino of the U. S. P. VIII was not a satisfactory preparation. The addition of glycerin and the attempt at filtration meant a long exposure with associated contamination which engendered enzymic action and the early gelatinization of the product. The U. S. P. IX directs the extraction of the kino in a flask with boiling water, the alcohol being added to the cooled decoction and the tincture decanted and strained. By this simplified process, exposure of the kino is avoided and a more permanent preparation is secured.

Tincture of Nux Vomica is now directed to be made directly from the powdered drug by percolation with the menstruum and then assayed, the standard being fixed at total alkaloids .25 Gm. in 100 mils instead of strychnine 0.1 Gm.

In Tincture of Sanguinaria, hydrochloric acid is directed in place of acetic acid, with the alcoholic strength of the menstruum remaining the same as in the previous revision. One has but to try the use of hydrochloric acid in the extraction of sanguinaria to note its value for this purpose.

In the Tincture of Strophanthus, we note a decided improvement over the formula of the U. S. P. VIII. Strophanthus is a drug that is very difficult to extract and its large percentage of disagreeable fat is another troublesome factor. The U. S. P. VIII directed that the tincture be made with a menstruum consisting of 65 volumes of alcohol and 35 volumes of water without previously de-fatting the drug. The resulting tincture was cloudy from separated oil and was exceedingly nauseating because of the presence of the fat.

The medical use of strophanthus is such that this nauseating tendency of the preparation should be eliminated. The formula of the U. S. P. IX is a decided improvement over that of the previous edition in that the drug is first de-fatted by preliminary treatment with purified petroleum benzin. The use of alcohol 95 per cent. as the menstruum is likewise to be commended as more nearly extracting the drug and yielding a more definite preparation.

THE SUCCESS OR FAILURE OF HIGHER EDUCATION IN PHARMACY.

By C. Ferdinand Nelson, Ph.D.,

Associate Professor of Physiological Chemistry, University of Kansas School of Pharmacy, Lawrence.

There exists at present very little, if any, difference of opinion on the question of the desirability and absolute necessity of thorough general and scientific training as a preparation for those who expect to enter the practice of pharmacy. Higher education is steadily gaining ground and making its new converts daily. Indeed, very often the men who have themselves never enjoyed the opportunities of adequate training are the very ones who insist most strongly that the young men and women entering this field should do so only after they have received a thorough preparation. Our state boards have almost without exception recognized the value of preliminary as well as properly organized technical education, and in their rulings have constantly sought to raise educational requirements. Our colleges of pharmacy are increasing their entrance requirements year by year and making their courses more thorough and comprehensive. Many of our schools have today requirements for entrance as high as some of the medical colleges of the country, and courses which require three or four full academic years for completion. The net result of this must be that we will have a much larger number of thoroughly equipped men in the future than we have had in the past. We may indeed congratulate ourselves that our calling is moving onward in this splendid way.

Let us now stop to ask ourselves seriously how long we may hope for the important advances we have mentioned to continue. What

factors are there which will determine the ultimate success or failure of higher education in pharmacy? No one person should be so bold as to attempt to answer this question outright. Innumerable factors enter into the solution of a problem of this sort, and in any one discussion it seems best to center all of one's thought and energy on a single phase, seeking to make this clear. I shall, then, in what follows attempt to review in another light a point of view which I have expressed several times before and which seems to me to be fundamental in any consideration of the future growth and successful development of pharmacy.

The point to which I desire to invite your attention may be briefly put in this way. *In proportion as we increase our educational requirements, we must also increase the unity and stability of our professional life.* There must be, in other words, something worth while for the prospective pharmacist to look forward to when he graduates. The business prospects in pharmacy, which are, to be sure, very important, we may leave out of consideration for the moment, since they enter only indirectly into a consideration of unity and stability in the sense in which we are using these terms.

We may admit at the outset that we do have a kind of unity, this largely, however, in the sense that most of us work in, manage or own retail drug stores, and therefore have economic interests in common. This type, however, will not suffice for us. Carpenters, plumbers and members of all of the trades have more of it than we have. It aims at mutual protection almost entirely, and nothing but that. *We need economic coöperation, to be sure, but we need even more a unity which makes us feel and act as if we were members of a really permanent profession.* The lack of this continually robs us of our real strength and makes many smile at the mere mention of such a thing as a professional side to pharmacy. We must build up and strengthen the professional side of our work if we hope to continue to enforce rigid requirements for admission to practice. What else can there be for the young man who is about to enter our ranks? Certainly not financial rewards, surely not an easy life. *He must receive compensation in part, at least, from a consciousness that he is a member of a calling which enjoys the esteem and respect of the public as well as of the other professions.* Only on such terms will he be willing to spend the time, money and energy which are needed in order to fit him for his work.

While it is impossible in any one statement to speak the literal

truth regarding conditions that obtain in all of the states of the Union, still it can be safely said that, taken as a whole, our pharmacy laws are in many vital respects *decidedly out of date,* and in woeful need of revision. *Our capacity to legislate has not kept pace with our business or professional growth, and while doctors, dentists and lawyers have secured much-needed legislation for themselves we have had to go away all too often empty-handed.* One very good reason for this is that we have not been sufficiently interested in demanding our rights, nor have we been able to bring enough pressure to bear to interest legislators in our behalf. Another and even more potent reason is that we have not enjoyed the respect of the public sufficiently to have created an adequate opinion in our behalf.

How, then, can we set about to secure a better reputation for pharmacy? Let us begin by attempting to become legally on par with the other professions. Let us ask the state for the same recognition that it now accords to law, medicine and dentistry. Let us substitute for annual registration a life permit to practise. Then and only then can we call ourselves pharmacists in any real, vital and significant sense.

The great pity is that some ardent workers for the good of pharmacy persist in confounding the question of the desirability of registration with the question of asking the state to grant life-long permits to practise pharmacy after proper examinations have been passed. The question of whether or not it is desirable to have annual registration to protect and adequately safeguard the pharmacists' interests does not at all enter into consideration. Let us register our pharmacists annually or semiannually if we believe such measures are necessary. We may even do as Illinois and other states are doing with reference to registration of physicians; viz., deny the right to practise unless they are registered with the county clerk of the county where they reside. There are a hundred schemes that could be devised to secure these ends. We may even devise successful means of collecting enough fees to maintain our state boards until the legislatures become convinced that it is the duty and privilege of the states to appropriate for their support. *But let us speedily and forever abolish the present degrading annual procedure of granting new leases of professional life at one dollar and fifty cents per annum.* As a practical proposition it does of course "bring in the money." No one can deny that. It does help the secretary to collect the money the board needs and he does not

need to ask twice for it either. *But should any body of men have the power to deprive a man of his life work, with the years of toil and study which it has cost him, simply because he fails to pay an annual fee?* Such a condition does not find its counterpart in our entire social order. We are so accustomed to buying our "annual immunity" that most of us have come to feel the process entirely natural, and we either go blindly on thinking that it is for our own good, or we say, "Well, it's only a dollar and a half a year—that's fairly cheap. What's the use bothering about it? I'm willing to pay that much to keep protected and to prevent men from practising who have no license." We go on to build up pharmacy at the top and we leave the same old inadequate foundation below, without an added stone to strengthen it. A life permit to practise pharmacy would do more than any one other thing possibly could to create unity and give stability to our calling. It would help to create a professional atmosphere and lend dignity to our work. It would help to bring about conditions that would best enable us to continue our policy of higher education, which is vital to our existence.

EARLY CHEMICAL MANUFACTURING IN PHILADELPHIA.

By Professor Samuel P. Sadtler.

The earliest efforts at chemical manufacturing in Philadelphia as in other parts of the American Colonies were undoubtedly due to the feeling of the colonists that they must free themselves from oppressive trade regulations of the mother country. We read in the sketch of the career of one of the pioneers of Philadelphia chemical industry, the following:

> The earliest efforts of the colonists—the manufacture of coarse, woolen fabrics in 1719—so excited the jealousy of Great Britain that the English Parliament declared "that the erecting of factories in the colonies must be discouraged at all cost," so every enterprise met with great opposition. It was not, however, until 1774 that Pennsylvania became so aroused by English oppression of her industries that a convention of delegates from all the counties was held in Philadelphia. Joseph Reed was president, Jonathan B. Smith, John Benezet and Francis Johnston were secretaries. The convention earnestly enforced the strict observance of non-importation agreements and to provide against the inconvenience which might result, recommended the

preservation of sheep until they were four years old, and the immediate establishment of the manufacture of woolens, salt, saltpetre, iron, nails, copper in sheets and kettles, malt liquors and gunpowder especially, "as there existed a great necessity for the latter, particularly in the Indian trade." The convention advised the exclusive use of home manufactured articles and urged that associations be immediately formed for the encouragement of all domestic productions.

This feeling only came to a head about the time of the beginning of the Revolutionary War. Prior to that in the Colonial period, the production of potashes and lime, some attempts at the extraction of salt from brines, tentative efforts at the making of gunpowder, and domestic utilization of the potashes in soap-boiling about comprised the chemical manufacturing industry. Of these the most important was the manufacture of potash from wood ashes. Scharf and Westcott's History of Philadelphia states that in 1772 the value of the potashes manufactured in America was £50,000.

As before stated, the oppressive trade regulations of England acted as an impelling force in the establishment of chemical industries. Thus the exportation of powder and its materials from England was prohibited by an order of Council of October 19, 1774, so that the American Colonies were made dependent on other sources for their supply.

The Continental Congress in various ways encouraged the erection of powder mills and also the production of nitrate of potash. Congress in 1775 published a manual giving directions for making saltpetre, and about the same time the "Committee of the City and Liberties" erected a large saltpetre works on Market Street for the double purpose of making saltpetre and also to instruct such as were willing to engage in the making of this very necessary article for the powder mills.

The manufacture of gunpowder was very extensively carried on during the Revolution in nearly all of the American Colonies. A very large proportion of this powder, however, was made in Pennsylvania. Philadelphia was among the first places in which powder mills were successfully operated.

Early in the Revolution a public powder mill was established in or near Philadelphia by the Assembly, while Congress opened, and for some time operated, what was known as "The Continental Powder Mill." Congress also offered advances to such persons as would be willing to establish powder mills within fifty miles of the city of Philadelphia, and this offer was taken advantage of by many who subsequently supplied a liberal proportion of the powder used in the Continental Army.

But to come back to the efforts of the Colonists to free themselves in other lines from dependence on the mother country, we

read in the sketch of the career of Samuel Wetherill, from which we previously quoted:

Samuel Wetherill was one of the promoters and managers of the "United Company of Pennsylvania for the establishment of American Manufacturers." He embarked his whole soul in the business, and in 1775 set up at his own dwelling house in South Alley, then called Hudson Square, now Commerce Street, a factory for jeans, fustians, everlastings and coatings. (Fustian is a cloth, the warp of which is linen and the woof thick cotton. It derived its name from Fusht, a town on the Nile where it was first made.) This business was just for spinning and carding and did not necessitate any heavy machinery, but in order to properly prepare these goods it was necessary to have them dyed. There being no dyers in Philadelphia equal to the task, Samuel Wetherill was obliged to undertake this branch of the business also. His house on South Alley is described as being of two frames, which I suppose means what we would call a double house, and he was probably able to turn one frame into a factory and let his family live in the other. However that may be, a little inconvenience more or less in those days did not matter, where all were working together for the common good and for the highest principles. . . . So it was that Samuel Wetherill, who started as a carpenter, became a weaver, then chemist, etc., and when the war broke out he did not scruple about entering into a contract with Congress to furnish clothes for the patriot troops, being a patriot himself; and it is said that his timely shipment of supplies to Washington's little army at Valley Forge saved it from disbanding. This, his allegiance to his country, and his expressed approval of bearing arms for its defense, were the cause of his being "dealt with" by the Society of Friends and cut off from religious communication and fellowship with them. Thereupon he and a few others who had publicly taken the oath of allegiance to the American cause started the Society called the "Free or Fighting Quakers."

Probably the first to inaugurate the manufacture of chemicals, as such, in this country, was the firm of Christopher, Jr., and Charles Marshall, sons and successors of Christopher Marshall, an early druggist and one of the original "fighting Quakers" of Philadelphia; this firm had, as early as 1786, entered quite extensively into the business of making muriate of ammonia and Glauber's salt. The factory is described by Watson, in his "Annals of Philadelphia," as being a grim and forbidding-looking building on Third Street near the stone bridge over the Cohocksink Creek. This firm is said to have developed an annual output of upwards of 6,000 pounds of muriate of ammonia; quite an achievement for that time.

Manufacture of Sulphuric and Other Acids.

Let us now take up the beginnings of the manufacture in Philadelphia of one of the fundamentally important chemicals, viz., sulphuric acid. This substance is recognized as the basis of all chemical industries and its manufacture must precede that of most other

chemicals. The theory of the lead chamber process was already understood by chemists, by the middle of the eighteenth century. Ward had made it in England in 1740 on a large scale in glass vessels, and Dr. Roebuck first used leaden chambers instead of glass in Birmingham in 1746. The first lead chamber was erected in France at Rouen in 1766.

Mr. John Harrison, the son of Thomas Harrison, a member of the Society of Friends, was an early Philadelphia druggist who had completed his education by spending two years in Europe, in part under the instruction of Dr. Joseph Priestley, the famous English chemist. Upon his return he began, in 1793, the manufacture in Philadelphia of various chemicals, and notably of sulphuric acid. He had at first a lead chamber capable of producing 300 carboys of acid per annum, and his laboratory at this time was on the north side of Green Street, west of Third. In 1804, he established a new factory at Second and Huntingdon Streets, near Frankford Road, Kensington, but continued for a time the work on Green Street. In 1807 he built what was for that time quite a large lead chamber; it was 50 feet long, 18 feet wide, and 18 feet high, and capable of making nearly half a million pounds of sulphuric acid annually, the price of which was then as high as 15 cents per pound.

As is well known, acid produced in lead chambers, is not the oil of vitriol of commerce, and the only method known at that time to concentrate it to the required strength was by boiling it in glass retorts—a very precarious and dangerous process. The constant breakage of the glass largely increased the cost of the concentrated acid and the dangers of the work. To obviate this great trouble Mr. Harrison, in 1814, introduced the use of Platinum for the manufacture of sulphuric acid, for the first time, at least in this country. In the previous year, 1813, Dr. Eric Bollman, a Dane, had come to Philadelphia. Dr. Bollman was familiar with the metallurgy of Platinum, and a highly scientific man. He brought with him from France Dr. Wollaston's method for converting the crude grains of Platinum into bars and sheets. About the first use that Dr. Bollman made of these Platinum sheets was the construction, early in 1814, of a still for the concentration of sulphuric acid for the Harrison works. It weighed 700 ounces, had a capacity of 25 gallons and was in continuous use for fifteen years. This early application of platinum for such purposes was highly characteristic of the sagacity and ingenuity of the American manufacturer. At the time the use of this rare metal was a novelty in Europe and known only to a few persons and certainly entirely unknown in this country. It follows, therefore, that Mr. John Harrison was not only the earliest successful manufacturer of Sulphuric Acid in America, but the first in this country to concentrate it in Platinum.

Farr and Kunzi were next in Philadelphia to follow the lead of Harrison in making sulphuric acid which it is stated they did in 1812, and shortly thereafter Wetherill & Bros. also began the manufacture of sulphuric acid on the east bank of the Schuylkill River. Chas. Lennig, the founder of the present firm of Chas. Lennig & Co., Inc., also began the manufacture of sulphuric acid in 1829, Rosengarten & Sons shortly thereafter, and Carter & Scattergood in 1834 also were early manufacturers of sulphuric acid.

Nitric acid under the name of *aqua fortis* is mentioned in Scharf & Westcott's History of Philadelphia as made by Christopher Marshall, Jr., a Philadelphia druggist, at the close of the eighteenth century. A communication from Mr. Thos. Skelton Harrison says his grandfather, John Harrison, began to make both nitric and muriatic acids in 1804. Carter & Scattergood had it on their list of manufactures in 1834. Muriatic acid is also mentioned as made by this latter firm in the year 1834, as were tartaric acid and citric acid.

Manufacture of Paint Colors.

We have here another record of which Philadelphia may be proud. We have already referred to the energetic work of Samuel Wetherill in starting American lines of manufacture just prior to the opening of the Revolutionary War. About 1789 he began the manufacture of white lead in Philadelphia and persisted in it, despite great efforts made on the part of the importers to hinder him by underselling and misrepresenting him. The first white lead factory of Samuel Wetherill & Sons was built in 1804 at the corner of Broad and Chestnut streets, but it was burned down a few years later, and in 1808 they erected a new factory at Twelfth and Cherry Streets.

His son, Samuel Wetherill, Jr., was the active man of the concern, and assisted his father in all business matters. The enforced experience which was pressed upon them during the Revolution, concentrated their attention upon the manufacture and sale of chemicals, and they went into the drug business. In 1785 Samuel Wetherill & Son were located in Front Street above Arch. Here, for many years, "Wetherill's drug store" was an old landmark, and the place at which sons and grandsons were brought up to the business. The Wetherills were the pioneers in the manufacture of white lead. They established it before the year 1790. They erected extensive white lead works near Twelfth and Cherry Streets, which were burnt down in 1813, but afterwards rebuilt.

The fire which destroyed the white lead works proved to be incendiary and started by a young English officer the day before he sailed for England.

In October, 1811, Samuel Wetherill, Jr., obtained patents for a new mode of washing white lead and for screening and separating metallic from corroded lead in the process of making red lead, and using the first machine ever used for manufacturing purposes in the United States This method has been generally adopted and used by all makers of lead.

The name of the first white lead firm was Samuel Wetherill & Son, Samuel Wetherill, Jr., evidently being the active member. After his father's death in 1816, Samuel Wetherill, Jr.'s, sons joined in the business and the firm became Samuel Wetherill & Sons. After the death of Samuel Wetherill, Jr., in 1829 it became Wetherill Brothers. The store of the firm was at 65 N. Front Street, the warehouse and mill of the old establishment were on Coomb's Alley, back of Second Street.

When the residence part of the city spread to Twelfth and Cherry Streets, Samuel Wetherill having bought ten acres of land on the bank of the Schuylkill River below Chestnut Street, there in 1847, his sons, Wetherill and Brother, built the white lead and chemical works and continue to this day.

John Harrison also began the manufacture of white lead in 1806. The firm of Mordecai & Samuel N. Lewis, which afterwards became John T. Lewis & Brothers, also began the manufacture of white lead in 1812, making three Philadelphia firms manufacturing paint colors at that time. These three earliest manufacturers of white lead and paint colors or their lineal successors have continued in business to the present time, or considerably over a century, and have done much to give Philadelphia its long continued prominence as a chemical manufacturing center.

Chromates were probably first made in Baltimore, though as early as 1816 a Mr. Wesener, a German chemist, had established himself in Philadelphia in the neighborhood of Broad and Cherry Streets, where he made chrome salts and chrome pigments in considerable quantities. Being nearer the source of supply of the raw material, the Baltimore manufacturers had a decided advantage, so much so that before the middle of the last century the business had drifted back to that city.

The manufacture of varnishes followed that of paint colors. Christian Schrack who was a manufacturer of paints in Philadelphia in 1816, later established the varnish manufacture, and already in 1836 an export trade in American made varnishes had begun.

The manufacture of shot by the granulation of lead while not properly called a chemical industry, is closely related to the lead pigment manufacture. This manufacture of lead shot was one of Philadelphia's earliest industries. From Winslow's "Biographies of Successful Philadelphia Merchants," page 142, we quote:

On the fourth of July, 1808, the corner-stone of the Southwark shot tower, in John Street, between Front and Second, was laid by the firm of Cousland, Bishop and Sparks, and the building was pressed forward rapidly to completion. Thomas Sparks paid particular attention to this branch of the business, and in a short time the patent shot of the firm became celebrated throughout the country. So long as this article was used by sportsmen and hunters, there seemed to be no difficulty about the propriety of the manufacture in the firm. But when the war of 1812 broke out, the firm then being Bishop and Sparks, the senior partner, who was a consistent member of the Society of Friends, felt conscientious scruples as to the rightfulness of continuing a manufacture which the United States now demanded should be turned to the production of munitions of war. John Bishop, therefore, withdrew from the firm, and retired from business.

Thomas Sparks, therefore, continued the business for several years alone. In 1818 he took into partnership his brother, Richard Sparks, and the firm continued at No. 49 South Wharves, as Thomas and Richard Sparks, the shot tower operations being in full play. It was necessary that they should reside near the tower, and accordingly Thomas had his house at No. 476 South Front Street and Richard at No. 478. This partnership did not last very long. Richard Sparks fell a victim to the yellow fever in the year 1821, and for many years Thomas Sparks continued at No. 49 South Wharves, and at the shot tower, without a partner. In the year 1838 he took in with him his nephew, Thomas Sparks, Jr., a son of Richard. The business was then conducted under the firm name of Thomas & Thomas Sparks, Jr., at the old stand, which from No. 49 South Wharves had become No. 49 South Delaware Avenue.

One of the lines of manufacture that contributed to make Philadelphia a great chemical center early in the last century was that of the yellow and red prussiates of potash. I have been furnished a private memorandum concerning the activities of the firm who began this industry and were active in it for many years.

Under the firm name of Carter & Scattergood a profitable chemical manufacturing business was conducted from 1834 to 1911; and was absorbed in the latter year by The Henry Bower Chemical Mfg. Co.

John Carter and Joseph Scattergood bought out the old established business of "John & Daniel Elliott" found in 1754 by their grandfather John Elliott.

The Elliotts' place of business and factory was originally on Front Street between Chestnut and Walnut Streets, but in 1812 the manufacturing work was transferred to a new factory which they erected at 19th and Pine Streets, John Carter becoming their apprentice January 1, 1816.

The list of chemicals produced by Carter & Scattergood was an extensive one, John Carter being the manufacturer and Joseph Scattergood the business man of the concern. It included Citric, Tartaric, Oxalic, Nitric and Sulphuric Acids, Bichromate and Prussiates of Potash and many other arti-

cles, but their operations during the first ten years of their business were on a scale which in this day would be considered quite small.

Yellow Prussiate of Potash was first made by them in 1834 (that being so far as known the first production of the article in America), but the demand was very small, only 472 pounds being absorbed by the market in that year. In 1835 the sales increased to 6,443 pounds, but it was not until 1843 that the demand became large, the sales amounting in that year to 69,470 pounds and rapidly increasing in the next two years, the sales in 1845 being 207,522 pounds.

The high price, over fifty cents per pound, and the keen demand of course resulted in active competition, and the market for many years was over-supplied.

In the year 1846 Carter and Scattergood began to produce Red Prussiate of Potash, being the first in America. This was a highly profitable branch of the business until the introduction of coal-tar dyes, as substitutes for prussiate colors on woolen goods, gradually displaced it in the most important field of consumption. Except for the manufacture of *Blue-Print Paper*, there is now very little demand for it.

Potash and ammonia alums were first made in Philadelphia by Chas. Lennig in 1837 and by Harrison Bros. in 1840.

Coming now to the early manufacture of medicinal or pharmaceutical chemicals which has long made Philadelphia famous, we find that George D. Rosengarten and Charles Zeitler as Rosengarten & Zeitler began the manufacture of chemicals in St. John Street, Philadelphia, about 1822. They were the first to manufacture the alkaloids of cinchona and opium in this country, having begun the manufacture of sulphate of quinine in 1823, of sulphate of morphia in 1832, and strychnine in 1834. The salts of quinine were also manufactured by John Farr in 1825.

These two firms and their successors have had much to do with the establishment of Philadelphia as a chemical manufacturing center. After the withdrawal of Mr. Zeitler, which took place within a year, Mr. Rosengarten continued alone, later taking in a Mr. Dennis. When this partner withdrew some twenty years later, the firm became Rosengarten & Sons, which business continued until the formation of the present combination with the other large Philadelphia manufacturer of medicinal chemicals, Powers & Weightman.

"Farr & Kunzi began the manufacture of chemicals about 1818. Abraham Kunzi, a Swiss by birth, retired in 1838, and the senior partner, John Farr, who had been born and brought up in England, associated with himself Thomas H. Powers and William Weightman, two young Philadelphians, who had been in the employ of the

firm for some time. The new firm name was John Farr & Co. This was later changed to Farr, Powers & Weightman, and, on the death of the senior partner in 1841, the firm name was again changed; this time to the title—Powers & Weightman," by which it was so long known throughout the entire country. These two firms in 1905 united under the name of the Powers-Weightman-Rosengarten Co. and continue as probably the best known manufacturers of general and medicinal chemicals in the United States.

The history of the commercial production of pure glycerine is also of interest in this account of Philadelphia's chemical achievements.

The late Robert Shoemaker while making medicinal plasters had his attention directed by Prof. Wm. Procter to the residuum liquid which was obtained. From this he prepared the first glycerine made in this city, if not in America, in 1846, and this was exhibited by Prof. Procter to his class at the Philadelphia College of Pharmacy at the time. Mr. Shoemaker manufactured it for sale according to his statement for some years in connection with the manufacture of lead plaster.

The later development of the refining of waste lyes containing glycerine was also a Philadelphia achievement and was worked out by the late Henry Bower. By the courtesy of his son, Mr. W. H. Bower, I am allowed to quote from a private letter which gives the account of his work, in his own words:

> Quite early in life, say in 1857, my attention was keenly directed to some mode of purifying these waste liquors of the Stearine Candle factories, and in that year I could have purchased the entire product of Crude Glycerine of the United States for a sum not exceeding $5,000, although the manufacture of it was nearly if not quite as large then, as now.
>
> I commenced work in earnest to experiment in purifying Glycerine in 1858—and expended long and weary efforts, all my earnings, as well as some borrowed money. I at first succeeded in producing an article sufficiently pure, for use in gas meters (in place of alcohol) to prevent freezing, and stoppage of the instrument—it was not however until about the middle of 1860 that I succeeded in making and placing in the market a "Pure Inodorous Glycerine"; even then the amount sold was quite insignificant. Inferior grades made their appearance about the same time in the West. The bland and neutral nature of the article, and the discovery of various uses for it, soon increased the demand to a marked extent; I was enabled from time to time to increase my works, and in increasing them was making steady inroad into the supply of the crude article. At this period—say in 1863—the business of refining Glycerine was scarcely known on the continent of Europe, and I

exported small quantities to Hamburg paying a profit; Belgium, France, Germany and Austria were immense producers of Crude Glycerine, but like its sister product here in previous years, it only found its way to the sea. As before stated, the use and sale of the Refined continued to improve, the crude growing more scarce each season, until a point has been reached when every available pound is worked into a valuable product. It would not be out of the way to place the total value of all the Glycerine sold in the United States at this time at half a million of dollars. This sum could never have been reached had it not been for the discovery of a mode for refining, to which, so far as this country is concerned, I lay claim; by a careful management of my business for some years I kept the process a secret, but in time some portions of it came to the knowledge of other persons, who have been enabled to produce very fair articles. There are besides myself, here, two refiners in Cincinnati, one in Chicago, and one in New York.

There were of course other drug and chemical firms who were well and favorably known in the early half as well as the later half of the nineteenth century.

We have already mentioned the name of Christopher Marshall, Jr., who was active in Revolutionary days. Himself the son of a druggist, he was succeeded by his son, Charles Marshall, and his grandson, Charles Marshall, Jr., who in 1814 established himself in the wholesale business at 310 Market Street.

With this Charles Marshall, Jr., entered as an apprentice Geo. W. Carpenter, who later became one of the most prominent as well as successful of wholesale druggists in Philadelphia. The old store of Carpenter & Henszey at Eighth and Market Streets I remember quite well as it stood about forty years ago.

A very well known drug firm of the latter half of the nineteenth century was that of Bullock & Crenshaw. They were the successors to Smith & Hodgson who established themselves as druggists at the corner of Sixth and Arch Streets in 1819 where they continued until 1849 when they disposed of their drug business to two of their employees who then formed the firm of Bullock & Crenshaw. This firm carried on not only a wholesale drug business but handled fine chemicals and chemical apparatus, supplying many colleges and schools throughout the country. In September, 1868, they moved to 528 Arch Street, where in larger quarters they carried on a flourishing business until the death of Mr. Chas. Bullock, the surviving partner.

The firm French, Richards & Co. was for many years one of the best known of Philadelphia drug firms at its centrally located

store, Tenth and Market Streets. The founder of this firm was Clayton French who in 1840 entered the drug business as an apprentice with a Dr. Edward S. Wilcox. This firm was disbanded in 1890 on the death of its founder, but in the meantime its extensive cement and plaster department which was started in 1852 at Callowhill Street and York Ave., had been erected in 1883 into a separate business of Samuel H. French & Co. This has since developed into a very extensive cement, plaster and dry color firm, now under the leadership of Howard B. French, a son of Samuel H. French of the original French, Richards & Co. firm.

In conclusion I wish to acknowledge my indebtedness to various friends for furnishing special information and the loan of papers, books and pictures of early chemical establishments. I would specially mention Mr. Wm. H. Bower, Mr. Wm. C. Carnell, Mr. Thos. S. Harrison, Dr. Ewing Jordan, the Librarian of the University Club, and Mr. Spofford, the Assistant Librarian of the Historical Society, Mr. Howard B. French, Prof. Henry Kraemer of the Philadelphia College of Pharmacy, and Mr. Martin I. Wilbert, formerly in this city but now in Washington, D. C. The last named published a valuable paper in the Franklin Institute Journal for May, 1904, on "Early Chemical Manufactures," from which I have quoted in the preparation of this paper.

NOTES FROM THE RESEARCH LABORATORY, PARKE, DAVIS & COMPANY.

Specific Therapy in Diseases of the Thyroid Gland.

The study of the ductless glands comprises one of the most fascinating fields of medical research and investigations of recent years have afforded some startling revelations of the importance of the internal secretions in controlling physical and mental development, metabolism and the vital body functions. A practical aspect of this line of experimentation in the application of such knowledge to the specific treatment of diseases correlated with disturbed glandular functions. The thyroid gland, in particular, is interesting in this connection because specific measures have been developed for the treatment of diseased conditions associated both with deficient functionating and with excess secretion.

The three classical types of disease due to decreased thyroid

secretion are infantile cretinism, cachexia thyropriva (cachexia strumipriva) and myxedema.

These diseases are characterized chiefly by physical and mental inertia; decreased metabolism; abnormal sensations of taste, smell, and hearing; subnormal temperature; slow, weak pulse; changes in the skin (dryness, abnormal pigmentation), falling and blanching of the hair, and tendency to obesity. In the infantile type, physical and mental development are greatly retarded and unless the thyroid deficiency is supplied such children become dwarfed and idiotic. The metabolism is decreased more in thyroid diseases than in any other known condition.

In addition to the above clear-cut instances of diminished secretion of the thyroid, there are a number of conditions of hypothyroidism of less severe types. Certain cases of anemia, scurvy, mental disturbances; retarded growth in children; fatigue from slight exertion; tendency to obesity; swelling of the joints attended with feeling of stiffness, dryness of the skin with tendency of the nails to crack, and often associated with caries (decay) of the teeth; and migraine—all these have been correlated by various investigators with deficient secretion of the thyroid.

On the other hand, the four cardinal symptoms of "hyper" or too copious secretion are, enlargement of the thyroid, rapid heart action, nervousness, and exophthalmos (protrusion of the eye balls), These, with other secondary symptoms varying in character, constitute the symptom-complex of Graves' disease (exophthalmic goiter). The thyroid enlargement, while one of the constant symptoms, is not, as a rule, very marked. The cardiac and nervous symptoms as well as the exophthalmos vary with the degree of hyper-secretion. In advanced cases of exophthalmic goitre with marked toxemia, the nervous and cardiac disturbances are often extremely severe.

In the treatment of the three typical forms of thyroid insufficiency, the use of thyroid preparations has been attended with strikingly good results. The early administration of thyroid products in cretinism enables these children, who would otherwise be dwarfed and idiotic, to develop normally, both physically and mentally. The glandular material must, however, be administered over a period of many years, often during the entire lifetime of the patient. In cachexia thyropriva and myxedema, results of treatment are very much the same.

With the other conditions which have been more or less loosely

associated with thyroid hyposecretion (thyroid insufficiency) the results, as might be expected, have been more or less irregular. Thyroid therapy is not to be regarded as a panacea for all of the ills which have been described in connection with thyroid disturbances, but its intelligent application will often prove of great benefit in some of these more or less obscure types of thyroid inefficiency.

Obesity is frequently found in conjunction with those clinical conditions associated with decreased thyroid activity, and it is a well-known fact that thyroid preparations are capable of bringing about a rapid loss in weight. Indiscriminate use of thyroid for this purpose is to be condemned. If given at all, it should be used only in the most conservative manner and combined with proper hygienic and dietetic measures.

The serum or whole blood of animals from which the thyroid glands have been removed has been used with considerable success, in the treatment of Graves' disease (exophthalmic goiter). In exophthalmic goiter, we have an increased thyroid secretion and consequently a toxic condition manifesting itself chiefly by profound disturbances of the circulatory and nervous systems. The utilization of the blood from thyreoidectomized animals is based on the knowledge that there are normally present in the blood, substances which are neutralized by the thyroid secretion and which, in turn, are capable of neutralizing the thyroid substance. The removal of the thyroid gland permits an accumulation in the blood or of other body fluids of these substances having a specific neutralizing power for thyroid secretion and the subsequent administration either orally or hypodermatically of the blood or serum of animals treated in this way, affords a satisfactory means of controlling the thyroid toxemia.

EDITORIAL.

The Advancement of Pharmacy in Minnesota.

It is a matter of gratification to all those interested in the development of pharmacy to note the active interest displayed by the members of the Minnesota State Pharmaceutical Association in securing a prerequisite law. Mr. Ebert, the champion of the retail druggists, when he lived said that "the Laws to regulate the practice of pharmacy should protect the public, in whose interest they

are enacted and they should also in some way benefit the druggist." In those states where prerequisite laws have been enacted there has never been the slightest desire to repeal such legislation, for it has been found not only helpful to the pharmacists themselves, but of incalculable benefit to the public. All legislation which is not built on the bed rock of the necessity of prerequisite educational requirements, tends to the multiplication of drug stores and the demoralization of the practice of pharmacy. The failure to see this has been the chief cause in preventing the universal elevation of the apothecary in the United States and has caused the multiplication of evils connected with pharmacy. The time has gone by when any but the thoroughly educated applicant can be considered competent to own and conduct a drug store. It long has been known, as was expressed by Hallberg in 1893, that "the average young man with two or three years experience in four or five different drug stores, by investing a few dollars in quiz compends and watching the journals for the publication of questions, finds it a comparatively easy matter to pass a Board of Pharmacy Examination at the third or at the most the fifth time, that he applies."

The recent report issued by the Legislative Committee of the Minnesota State Pharmaceutical Association is of more than local interest. Three fourths of the active registered pharmacists of that state have voted on the question of having a prerequisite pharmaceutical education bill introduced in the coming session of the Minnesota Legislature, and approximately 80 per cent. of those voting favor the proposed measure.

The following table is of interest in showing how Minnesota pharmacists voted on the matter of introducing a Prerequisite Pharmaceutical Education Bill in the next session of the Minnesota Legislature (see page 40).

The problems of Minnesota pharmacists are similar to those which other pharmacists are giving much thought to at the present time. The sale of drugs and medicines by peddlers and other unqualified merchants, dispensing by physicians, the supply of competent drug clerks, the rapidly increasing number of drug stores, and the methods to be employed for training the future pharmacists are all questions which cannot possibly be satisfactorily adjusted until pharmacy is placed upon a sound professional basis.

These questions furthermore are public-health problems, for the practice of pharmacy stands next to the practice of medicine in

	A Total number Pharm.	*B* Total number voting	*C* Per cent. of *A* voting	*D* Voting yes	*E* Voting no	*F* Per cent. of *A* voting yes	*G* Per cent. of *A* voting no	*H* Per cent. of *B* voting yes
Minn. Regis. Pharm. act. engaged in Minneapolis	375	245	65.3	188	57	50.1+	15.2	76.7+
Minn. Regis. Pharm. act. engaged in St. Paul....	218	131	60.0+	105	26	48.1+	11.9+	80.1+
Minn. Regis. Pharm. act. engaged in Duluth	66	36	54.5	29	7	43.9+	10.5+	80.5+
Minn. Regis. Pharm. act. engaged outside of above three cities.....	881	652	74.0+	496	156	56.3	17.7	77. −
Total number of Minn. Regis. Pharm. act. engaged in the State.....	1,540	1,059	69.	814	245	53.	15.9	77.

NOTE:— 7 votes non-committal were received.
7 ballots were sent in marked "yes" but without signature.
1 ballot was sent in marked "no" but without signature.
12 ballots, all marked "yes," were received from M. S. Ph. A. members outside of Minnesota.
145 ballots marked "yes" and 10 marked "no" were received after the above table was compiled.

rendering pharmacological service to the public. The social and moral welfare of our communities is involved, for pharmacists by law hold the responsible duty of restricting to proper and legitimate uses narcotic and poisonous drugs.

Educational preparedness has brought forth success and prosperity in many fields of endeavor and it will do for pharmacy what it has done for other occupations. Of all the states in the Union, Minnesota stands to-day unexcelled in point of equipment and facilities for imparting pharmaceutical instruction. It is, therefore, not surprising that the pharmacists of the state have grasped the opportunity afforded them to secure that which will be of benefit to pharmacy and the public.

The professional drug business is constantly being demoralized by commercial influences, and not the least among these is the medicine peddler. These vendors with little knowledge of drugs and medicines are practicing pharmacy, and in some instances, medicine. State laws which to a degree restrict the practice of these professions to those best fitted by educational qualifications are therefore not infrequently nullified. Legislative bodies should increase the educational qualifications requested by pharmacists and by so doing provide professional pharmacists for the future who would unques-

tionably be best fitted to give that protection which the public has a right to demand.

Those who have made a careful study of the development of pharmacy and medicine in this country are not quick to condemn in inexcusable terms the practice of dispensing by physicians, or the sale of articles included in the so-called side lines of the pharmacist. These practices have arisen in most instances, no doubt, not from a matter of choice, but rather from necessity. The country, a few years ago, was being oversupplied with graduates in medicine. At the present time we have one physician for approximately every 700 persons. Before this time many physicians sought to increase their revenue from other sources than professional fees. Physicians could not well engage in the sale of miscellaneous merchandise, but they could sell drugs, and the result was dispensing physicians. Fortunately for medicine, and the public as well, the annual number of graduates from our medical schools is now less than half of what it was a few years ago. This change has been brought about by increasing educational requirements, the only manner in which such control can be regulated under our system of government.

The public needs not more physicians, but better physicians, and likewise in pharmacy the real need is not for a larger number of pharmacists, but rather for better pharmacists. Such conditions can obtain only when the number of pharmacists is not in great excess of the professional service demanded, as at present.

The profession of pharmacy is gradually going through an evolution similar to that through which medicine has passed. Higher educational requirements for pharmacists will in time reduce the number of drug stores to a point more nearly in accord with the pharmaceutical requirements of the public. Pharmacists and the general public are rapidly coming to appreciate the importance of legislation along these lines, and prerequisite bills will be introduced in the legislatures of the following states this month: Indiana, New Jersey, North Carolina, South Carolina, Tennessee, Colorado, Michigan, Montana, Iowa, Virginia, Louisiana, Illinois, West Virginia and Minnesota.

When standards commensurate with the profession are established, pharmacy will develop professionally. The public demands professional pharmaceutical service and pharmacy should therefore be maintained under such conditions that the public may receive the best expert service.

The interest of the public in the development of professional pharmacy was well expressed by the late Gov. Winfield S. Hammond who stated (AMER. JOUR. PHARM., 1915, p. 142), "It would be unfortunate if this old-time honorable profession should become merely business. . . . We would not want our lawyers, our doctors, our apothecaries, our clergymen to be distinguished principally as mere business men. We like to have them remain in the realm of professionalism, and be as great and as useful in professional work as others are in the business field. . . .

"We are all interested in legislation tending to restrict the use of noxious drugs. Here is a line of endeavor that, of course, should be absolutely divorced from the business end of the work. Here is a question that appeals to you as professional men and as men who desire to adapt your profession to the best interests of your brothers and your sisters, and any attempt, I fear, to connect this kind of legislation with the business end of the pharmacist's occupation and profession would tend to detract from the high professional standing that the apothecary has always had and that the modern pharmacist should endeavor to maintain."

BOOK REVIEWS.

A TREATISE ON PHARMACY FOR STUDENTS AND PHARMACISTS, by Charles Caspari, Jr. Fifth Edition, Enlarged and Revised. Illustrated with 337 engravings. Publishers, Lea and Febiger, Philadelphia and New York.

This textbook for students of pharmacy is intended as a compendium to the United States Pharmacopœia and the National Formulary. The recent revision of these two legal authorities for drug standards and formulas necessitated the fifth edition of this publication to bring it up to date and in order that its statements may conform to the official requirements.

From the viewpoint of the book maker, the book is excellent; paper and binding both good, type clear, and the illustrations, judicious selections, well serving their purpose. The typographical errors are few indeed: unfortunately, the typesetter had to bungle "official formulas" on the first page of the preface.

The subject matter is divided into three parts. Part I is called General Pharmacy and treats of the pharmacopœias and what could

be termed the Physics of Pharmacy. Part II is named Practical Pharmacy and this could with propriety be denominated Galenical Pharmacy. Part III is a concise treatment of Pharmaceutical Chemistry.

Chapter I is a succinct account of the intent, history and plan of the United States Pharmacopœia. In subsequent chapters of Part I the subjects of weights and measures, specific gravity, heat, subdivision of drugs, solution, etc., are presented. The chemical and physical principles underlying the process of solution are set forth and the subject of "Colloidal Solutions" is clearly explained in a paragraph devoted to this interesting phenomenon.

One notes that throughout the book the word "mil" is always followed by "(or Cc.)." The publicity already given to the adoption of the word "mil" by both the U. S. Pharmacopœia and the National Formulary should have obviated the necessity for anything more than an explanatory statement and this monotonous tautology could have been omitted.

The subject of Sterilization is considered in "Chapter VII. Solution" and again in "Chapter IX. Separation of Non-Volatile Matter." Sterilization and pasteurization are of sufficient importance to merit treatment in a separate chapter as distinct processes and more especially since the Pharmacopœia and National Formulary have set such an example which can be followed by works on pharmacy.

In a short chapter "Crystallization" is admirably presented to the extent of the needs of the pharmacist.

Under the classification of the products used in pharmacy, we note that in the treatment of "Fats," the various official fixed oils and fats are enumerated and in a separate paragraph each is described, and then in a chapter in Part III. Pharmaceutical Chemistry, much of this is repeated.

There are a few statements in the book to which one may take exception. The pharmacist will object to considering the official Compound Solution of Cresol as an emulsion (p. 369). Botany requires exact adherence to its scientific terms and definitions. The statement on page 108, "only the inner bark being employed, the outer *epidermis* should be removed," is subject to the criticism that the writer evidently uses "epidermis" when he intends the outer layers. In the official barks the outer portion removed is much more than the epidermis and not infrequently includes the cork and

even the primary cortex. Another inaccuracy is noted on page 363, where lycopodium is in the following quoted sentence twice referred to as a *seed:* "In making emulsion of lycopodium, it becomes necessary to triturate the *seed* dry, with some pressure, in order to rupture the hard *seed* envelope."

The tendency among the modern authors on pharmacy is to differentiate more clearly and sharply between the various classes of medicinal preparations. In this book the differentiation has not been as clearly drawn and distinct as could reasonably have been expected. An example of this is seen in the consideration of "Ampuls" in the chapter entitled "Compressed Tablets and Tablet Triturates." The method of preparation of ampules and the finished products bear no relation or similarity to tablets and their manufacture. Moreover, the extensive use of ampules for exhibiting all forms of medicine warrants a separate chapter devoted to that subject. Similarly, we note that in the chapter on "Pills" there is introduced in the discussion of pill making and coating a description of the methods and machinery employed in manufacturing soft elastic capsules and gelatin globules or pearls for encapsulating liquids. Would it not have been a better classification to have treated Suppositories in the chapter devoted to "Ointments, Cerates and Allied Preparations" rather than with Plasters? Possibly the importance of Suppositories as a distinct dosage form should have necessitated a separate chapter on that subject.

The various classes of official preparations are, as a rule, commendably treated and the tabulations commonly used for their presentation, while concise, are clear expositions. The chapter on Syrups is an excellent example of such tabulation.

"The Prescription" is very quickly dispensed in a chapter of less than fourteen pages, of which three pages are devoted to sample prescriptions and three pages to abbreviations and terms used in prescription writing. The subject of incompatibility, so closely related to the pharmacists' important duty of compounding prescriptions, is treated in a prior chapter on "Mixtures," which is largely devoted to the consideration of the official mixtures.

There is much to commend in this volume and comparatively little of importance to criticize adversely. The defects pointed out are, after all, only minor ones that can be readily corrected in a future edition and will detract very little from its serviceableness as

a textbook. The very conciseness and clarity of the author's expounding of the formulas and requirements of the U. S. P. and N. F. accrue to the value of the volume and make it more useful as a textbook for pharmaceutical students. Doubtless, it will well serve the purpose of the author as "a guide to the intelligent study of these two national authorities."

G. M. B.

LESSONS IN PHARMACEUTICAL LATIN AND PRESCRIPTION WRITING AND INTERPRETATION, by Harry G. Muldoon, Ph.G., Instructor in Latin, Massachusetts College of Pharmacy. Published by John Wiley & Sons.

This little volume is intended for medical and for pharmacy students. So in addition to the customary lessons in Latin declensions and inflections, there is presented also information on prescription writing not only from the standpoint of Latin, but also involving the Metric System and the Harrison Antinarcotic Act. Special emphasis is placed on interpretation of Latin titles and of abbreviations, pronunciation of Latin being deemed of lesser importance.

"Neither drug store experience nor previous knowledge of Latin is assumed."

WILBERT MEMORIAL MEETING.

Forty-one representatives of various branches of the pharmaceutical and medical professions gathered in the Philadelphia College of Pharmacy on Thursday afternoon, December 7, 1916, at two forty-five P.M. to do honor to the memory of Martin Inventius Wilbert, who passed away on Saturday morning, November 25. Twenty-seven organizations of the chemical, pharmaceutical and medical professions were represented and Mr. Howard B. French, President of the Philadelphia College of Pharmacy, was unanimously chosen to preside at the meeting. Owing to pressure of other engagements, Mr. French relinquished the chair to Mr. George M. Beringer when the meeting was about half over. Robert P. Fischelis was unanimously chosen to act as secretary of the meeting. The following bodies were represented:

New York Branch of American Pharmaceutical Association,
New York College of Pharmacy,
Baltimore Branch of American Pharmaceutical Association,
Maryland College of Pharmacy,
New Jersey Pharmaceutical Association,
American Pharmaceutical Association,
American Chemical Society,
American Therapeutic Society,
American Academy of Medicine,
American Medical Association,
Pennsylvania Medical Society,
Pennsylvania Pharmaceutical Association,
Pennsylvania Society for Prevention of Tuberculosis,
United States Pharmacopœial Revision Committee,
National Formulary Revision Committee,
Council on Pharmacy and Chemistry of the American Medical Association,
Pennsylvania Board of Pharmacy,
College of Physicians of Philadelphia,
Philadelphia College of Pharmacy,
Philadelphia Branch of American Pharmaceutical Association,
German Hospital,
Philadelphia Association of Retail Druggists,
Philadelphia Drug Exchange,
Philadelphia County Medical Society,
Philadelphia Pediatric Society,
Child Federation of Philadelphia,
Philadelphia Medical Club.

While the secretary made note of the representatives present, Chairman French read communications from the following:

Dr. H. V. Arny, New York City,
Dr. John B. Deaver, Philadelphia,
Mr. John F. Hancock of Baltimore,
Mr. S. L. Hilton of Washington, D. C.,
Mr. Joseph L. Lemberger, Lebanon, Pa.,
Mr. David J. Reese, Philadelphia, Pa.,
Dr. I. V. S. Stanislaus of Lock Haven, Pa.

Professor Remington moved that a committee be appointed, which would as far as possible represent the associations taking part in the meeting, to draw up suitable resolutions, have them engrossed and sent to Mrs. Wilbert. The motion was seconded by Dr. F. E. Stewart, and carried. Professor Kraemer moved that a copy of these resolutions be also sent to Dr. Wilbert's parents. This motion was seconded by Mr. Thum and carried.

President French then declared the meeting open for comments on the life and activities of the departed. Professor Remington in a few well-chosen words related the circumstances connected with Dr. Wilbert's death and gave a general outline of his career in pharmacy. Dr. F. E. Stewart endorsed the sentiments expressed by Professor Remington and pointed out what a loss had come to professional pharmacy by the death of Dr. Wilbert. Mr. H. E. Smith, vice-president of the German Hospital, spoke of Dr. Wilbert's connection with that institution, lauding his work very highly. Professor E. G. Eberle read a beautiful tribute summing up the activities of Dr. Wilbert during his lifetime and referring to his influence upon modern pharmaceutical and medical thought. Dr. H. P. Hynson feelingly expressed his sense of loss through Dr. Wilbert's death, as he had been an intimate friend of the deceased for many years and shared his views on the pharmaceutical problems of the day. He urged that Wilbert's life and works be made a subject of careful study by the coming generation of pharmacists, as great good would surely come of his work if it be carried on to its ultimate conclusion. Professor Hostmann also expressed the view that Wilbert's influence on the younger men in pharmacy would be a profound one. Dr. J. W. Sturmer spoke of Dr. Wilbert's activities in the Philadelphia Branch of the American Pharmaceutical Association which he helped to organize, and said that the many printed pages in our pharmaceutical publications were monuments to Wilbert's career. His work has ceased but his influence will go on indefinitely. Professor C. H. LaWall referred to Dr. Wilbert's work as a member of the National Formulary Revision Committee and as the author of "Digest of Comments on the Pharmacopœia and National Formulary." Professor Henry Kraemer read a letter from one of Dr. Wilbert's sisters in which Dr. Wilbert's early history was portrayed. Dr. William D. Robinson, who had worked with Dr. Wilbert at the German Hospital, commented upon his scientific attainments, especially in the operation and development of the X-ray. He stated that Dr. Wilbert had been of incalculable value to the medical profession and had been ready and willing at all times to assist physicians in their work.

Other speakers were Drs. P. Samuel Stout, A. T. Pollard, Charles L. Turnbull and Franklin M. Apple.

Mr. George M. Beringer concluded the remarks with a reference to the magnitude of Wilbert's work and then appointed the following Committee on Resolutions: Chairman, Joseph P. Remington, W. D. Robinson, Henry Kraemer, E. G. Eberle, R. P. Fischelis.

ROBERT P. FISCHELIS,
Secretary.

CURRENT LITERATURE.

CONFERENCE ON MEDICINAL HERB GROWING

A Conference of Herb Growing Associations and of others interested in this new industry was held September 27 in London under the auspices of the Central Committee for National Patriotic Organisations, which has been strenuously endeavouring to place the industry on a sound footing.

The following resolutions were carried unanimously:

"1. That it is the opinion of this Conference that none of the existing organisations as at present constituted in connection with the growing and collection of medicinal herbs meets the needs of the industry from a national point of view, that these needs can only be met by the establishment of definite relations on organised lines between the organised and unorganised herb-growers of the country, the objects of which shall include the

"(*a*) Interchange of information and suggestions and the production and distribution of suitable literature and the organisation of propaganda.

"(*b*) Investigating of the requirements of central, local, and other markets, and regulating prices.

"(*c*) Regulating of the production, collection, treatment, output and delivery of herbs to meet the needs of the various markets.

"(*d*) The furnishing of the necessary funds to accomplish these objects.

"2. That the consideration of how best to establish such relations and carry out the aforementioned objects be referred to a special committee, not exceeding twenty-one in number." On this committee were to be representatives of the various herb-growing associations of Scotland, Ireland and England.